NUI Galway
OÉ Gaillimh

Autumn Examinations 2018 / 2019

Exam Code(s)	4BCT1, 4BP1
Exam(s)	B.Sc. Degree (Computer Science & Information Technology) Bachelor of Engineering (Electronic and Computer Engineering)
Module Code(s)	CT417
Module(s)	Software Engineering III
Paper No.	1
External Examiner(s)	Dr. Jacob Howe
Internal Examiner(s)	Prof. Michael Madden *Dr. Michael Schukat

Instructions: Answer any 3 questions.
All questions carry equal marks.

Duration	2hrs
No. of Pages	5 (Including cover page)
Department(s)	Information Technology
Requirements	None

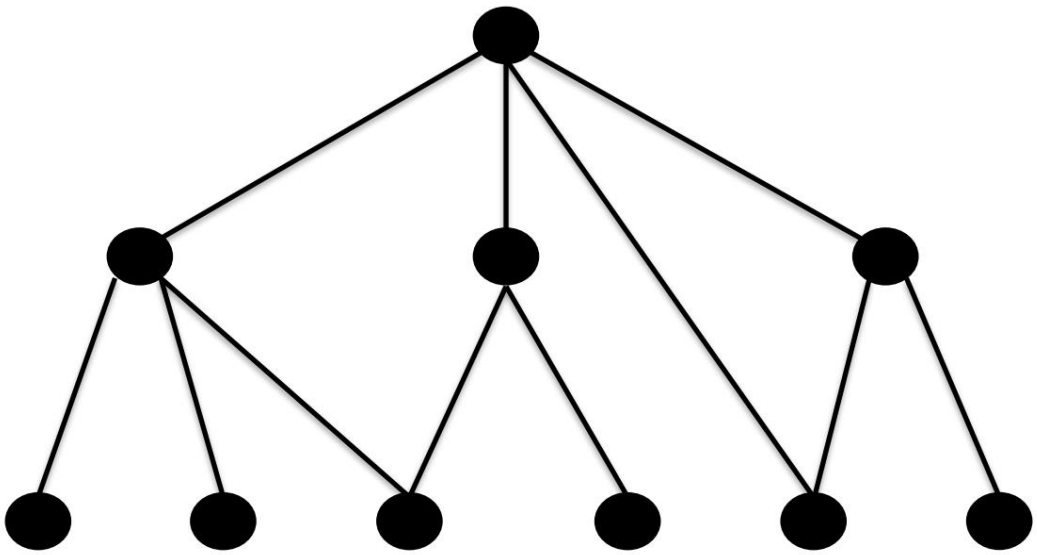
Q1. (20 marks)

(a) Identify the spanning tree for the following software module design, and calculate the values for **Tree Impurity (m(G)) and Internal Reuse (r(G))**.

Remember:

$$m(G) = \frac{number\ of\ edges\ more\ than\ the\ spanning\ tree}{maximal\ number\ of\ edges\ more\ than\ the\ spanning\ tree}$$

$$r(G) = number\ of\ edges\ additional\ to\ the\ spanning\ subtree$$



6 Marks

(b) Differentiate between **centralised version control systems** and **distributed version control systems**. In your answer highlight similarities, differences, advantages and limitations of both concepts.

7 Marks

(c) Draw the following labelled flowgraphs:

- **D_1 ; D_3**
- **$D_1(D_2)$**

Include the corresponding pseudocode for each of the program constructs.

7 Marks

PTO

Q2. (20 marks)

(a) What is meant by the **Response for a class (RFC)**?
Calculate the RFC for the class *classA* as shown below:

```
public class ClassA
{
  private ClassB classB = new ClassB();
  public void doSomething(){
    System.out.println ( "doSomething");
  }
  public void doSomethingBasedOnClassB(){
    System.out.println (classB.toString());
  }
}


public class ClassB
{
  private ClassA classA = new ClassA();
  public void doSomethingBasedOneClassA(){
    System.out.println (classA.toString());
  }

  public String toString(){
    return "classB";
  }
}
```

8 Marks

(b) For the following code example calculate the **branch** and **line coverage** produced by a test where isLoggedIn is set to true:

```
public void loginStatus(boolean isLoggedIn)
{
        if(isLoggedIn)
        {
                System.out.println("User is logged in");
        }
        else
        {
        System.out.println("User is not logged in");
        }
}
```

4 Marks

(c) Describe and summarise the core components of a modern **continuous software development system** as discussed in the lectures. In your answer outline how these components interact, and how they are inter-linked.

8 Marks

PTO

Q3. (20 marks)

(a) Describe, using examples, the following object-oriented measures:

- Coupling between objects
- Weighted methods per class
- Specialisation Index

6 Marks

(b) Provide explanations / definitions for the following **Extreme Programming Practices**:

- Test-driven development
- Metaphor
- Collective ownership
- Pair programming
- Planning game

6 Marks

(c) The **scheduling of parallel loops** is an important element of OpenMP. Summarise characteristics, similarities and differences between the following OpenMP schedules:

- Static
- Interleaved
- Dynamic
- Guided

8 Marks

PTO

Q4. (20 marks)

(a) Using code snippets and / or diagrams explain the following terms used in **parallel programming**:

a. Race condition
b. The fork / join model
c. SMT
d. Fine-grained parallelism versus coarse-grained parallelism
e. Schedules and chunks

10 Marks

(b) For the following class, calculate the **Lack of Cohesion of Methods (LCOM)** measure:

```
class Account
{
        String id;
        double balance;
        double RATE = 1.11;

        public getID(){ return this.id; }
        public getBalance(){ return this.balance; }

        public credit(double amt)
        {
                this.balance += amt;
        }

        public debit(double amt)
        {
                this.balance -= amt;
        }

        public getExchangeRate(){ return this.RATE; }

        public setExchangeRate(double v)
        {
                this.RATE = v;
        }
}
```

8 marks

(c) Briefly explain why highly cohesive classes tend to have small LCOM values.

2 Marks